

CEGS-0XXXX  
(Aug 90)

DEPARTMENT OF THE ARMY  
(August 1989)  
U.S. ARMY CORPS OF ENGINEERS

CEGS-0XXXX

## GUIDE SPECIFICATION FOR MILITARY CONSTRUCTION

### SECTION 0XXXXX

#### DRAINAGE LAYER

\*\*\*\*\*  
NOTE: This guide specification covers the requirements for drainage layer material under roads, streets and airfield pavements. This guide specification is to be used in the preparation of project specifications in accordance with ER 1110-345-720.  
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#### PART 1 GENERAL

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NOTE: See Additional Note A.  
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##### 1.1 SUMMARY (Not Applicable)

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NOTE: Paragraph "1.1 SUMMARY (Not Applicable)" is required in all CEGS in order to make CEGS compatible with guide specifications of other agencies within the SPECSINTACT system. However, this paragraph is not to be included in Corps of Engineers project specifications.  
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##### 1.2 REFERENCES

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NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest change (Notice) to this guide specification.  
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The publications listed below form a part of this specification to the extent referenced. The publications are

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referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

\-ASTM C 29-\	(1987) Unit weight and Voids in Aggregate
\-ASTM C 88-\	(1983) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
\-ASTM C 117-\	(1987) Materials Finer Than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by washing
\-ASTM C 131-\	(1981; R 1987) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
\-ASTM C 136-\	(1984; Rev. A) Sieve Analysis of Fine and Coarse Aggregates
\-ASTM D 75-\	(1987) Sampling Aggregates
\-ASTM D 1556-\	(1982) Density of Soil In-Place by the Sand-Cone Method
\-ASTM D 2922-\	(1981) Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
\-ASTM D 3017-\	(1978) Moisture Content of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
\-ASTM E 548-\	(1984) Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies

\-CORPS OF ENGINEERS (COE)-\

\-COE CRD-C 119-\	\(1953: Rev Jun 1963) Flat and Elongated Particles in Coarse Aggregates\
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1.3 MEASUREMENT AND PAYMENT

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NOTE: This paragraph shall be deleted when the work is  
covered by a lump-sum contract price.  
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#### 1.3.1 Waybills and Delivery Tickets

Copies of waybills and delivery tickets shall be submitted during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

#### 1.3.2 Measurement

[The quantity of [drainage layer course][and open graded choke stone] material completed and accepted will be measured in square yards.) [The quantity of drainage layer material[and open graded choke stone material] completed and accepted will be measured in cubic yards. The volume of drainage layer material in place and accepted will be determined by the average job thickness obtained in accordance with paragraph "THICKNESS CONTROL" and the dimensions indicated.) [The tonnage of drainage layer material(and open graded choke stone material] used for will be the number of 2000-pound tons of aggregate, determined by the Contracting Officer, placed and accepted. Deductions will be made for any material wasted, unused, rejected, or used for the convenience of the Contractor.)

#### 1.3.3 Payment

##### 1.3.3.1 Quantity of Drainage Layer Material

Quantity of drainage layer material as specified above will be paid for at the contract unit price for [drainage layer material][and open graded choke stone], which will constitute full compensation for the construction and completion of the drainage layer, including the furnishing of all other necessary labor and incidentals.

#### 1.4 SUBMITTALS

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NOTE: Submittals must be limited to those necessary for adequate quality assurance. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required. Indicate submittal classification in the blank space using "GA" when the submittal requires Government approval or "FIO" when the submittal is for information only.

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Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section \=01300=\ SUBMITTALS:

\\*SD-09, reports\*\

Certified test results.  
Report of test section construction.  
Results of field tests.

## 1.5 COMPACTION

Field compaction requirements shall be based on the results of a test section constructed by the Contractor, using the materials, methods, and equipment proposed for use in the work. The test section shall be in accordance with paragraph "TEST SECTION". The test section shall be used to establish the number of passes of a roller, the target field dry density and the moisture content required for full scale production. Field density tests shall be taken to assure that the dry density is at least 100 percent of the target dry density.

## 1.6 EQUIPMENT

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NOTE: If desirable, requirements for specific types of equipment applicable to methods of construction based on local conditions will be included.

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All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate to meet grade control, thickness control, smoothness and compaction requirements as set forth herein. An asphalt paving machine shall be used to place the drainage layer [and choke stone]. A hopper type base course spreader box may be used if it can be demonstrated that the spreader box can be operated to obtain the specified results. Compaction shall be accomplished by using a 10 to 15 ton dual or single smooth drum vibratory roller.

## 1.7 Weather Limitation

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Drainage layer material shall be placed when the atmospheric temperature is above 35 degrees F. Areas of completed drainage layer that are damaged by freezing, rainfall, or other weather conditions or by contamination from sediments, dust, dirt, or foreign material shall be corrected to meet specified requirements.

## 1.8 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor subject to approval. If the Contractor elects to establish testing facilities of his own, approval of such facilities shall be based on compliance with \-ASTM E 548-\, and no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved. The first inspection of the facilities shall be at the expense of the Government and any subsequent inspections required because of failure of the first inspection will be at the expense of the Contractor. Such costs will be deducted from the total amount due the Contractor. The materials shall be tested to establish compliance with the specified requirements. Copies of test results shall be furnished to the Contracting Officer.

### 1.8.1 Samples

Samples for testing shall be taken in conformance with \-ASTM D 75-\ . When deemed necessary, the sampling will be observed by the Contracting Officer.

### 1.8.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

#### 1.8.2.1 \+Sieve Analyses+\

Sieve analyses shall be made in conformance with \-ASTM C 117-\ and \-ASTM C 136-\ .

#### 1.8.2.2 \+Density Tests+\

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Density shall be measured in the field in accordance with \-ASTM D 1556-\ \-ASTM D 2922-\. For the method presented in \-ASTM D 1556-\ the base plate as shown in the drawing shall be used. For the method presented in \-ASTM D 2922-\ the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph "Calibration" of the ASTM publication. Tests performed in accordance with \-ASTM D 2922-\ results in a wet unit weight of soil and when using this method, \-ASTM D 3017-\ shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in \-ASTM D 3017-\. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph "Calibration" of \-ASTM D 2922-\. on each different type of material being tested at the beginning of a job and at intervals as directed.

#### 1.8.2.3 \+Soundness Test+\

Soundness tests shall be made in conformance with \-ASTM C 88-\.

#### 1.8.2.4 \+Los Angeles Abrasion Test+\

Los Angeles abrasion tests shall be made in conformance with \-ASTM C 131-\.

#### 1.8.2.5 \+Flat or Elongated Particles Tests+\

Flat and/or elongated particles tests shall be performed in accordance with \-CRD-C 119-\.

#### 1.8.2.6 \-Fractured Faces Tests-\

When aggregates are supplied from crushed gravel, the aggregate shall meet the requirements for fractured faces in paragraph "AGGREGATES".

\*\*\*\*\*  
NOTE: Field density tests and laboratory tests are generally performed at a frequency of one set of tests for every 1000 square yards of completed area. Other frequency intervals may be specified when conditions warrant. It is important that both field density tests and laboratory tests be conducted on the same materials.  
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#### 1.8.3 Testing Frequency

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Sieve analyses and field density tests shall be performed at a rate of at least 1 test for every [1000] square yards of completed area and not less than 1 test for each days production. Soundness tests, Los Angeles abrasion tests, fractured faces tests and flat and/or elongated particles tests shall be performed at the rate of 1 test for every [10] density tests.

#### 1.8.4 Approval of Material

The source of the material to be used for producing aggregates shall be selected [\_\_\_\_\_] days prior to the time the material will be required in the test section. Approval of both the source and the material will be based on test section performance and tests for gradation, soundness, Los Angeles abrasion flat and/or elongated particles tests and fractured faces tests performed on samples taken from the completed and compacted drainage layer course.

## PART 2 PRODUCTS

### 2.1 AGGREGATES

Aggregates shall consist of clean, sound, hard durable particles of crushed stone, crushed slag, or crushed gravel. The Contractor shall obtain materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein, after all compaction (and proof-rolling) operations have been completed. Slag shall be an air-cooled, blast-furnace product having a dry weight of not less than 65 pcf as determined by \-ASTM C 29-\ . The aggregates shall be free of silt and clay as defined by \-ASTM D 2487-\ , vegetable matter, and other objectionable materials or coatings.

#### 2.1.1 Quality

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NOTE: The percentages of loss and soundness applicable to the specific job will be specified. A loss value of 40 will be used except that a value up to 50 percent may be used where local experience indicates that the material is satisfactory. The soundness test is for use in excluding aggregates known to be unsatisfactory and for evaluating aggregates from new sources. The Designer will insert in the blank space the applicable loss in percent for the specific job based on the knowledge of both coarse and fine aggregates in the area that have been previously approved and have a satisfactory service

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record for at least 5 years. The values in contract specifications will insure that aggregates from new sources will be equal to or better than aggregates from known or approved sources. The percent of fractured faces may be reduced to 75% if the required CBR is 50 or less.

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Aggregates shall be angular particles of uniform density. The aggregate shall have a loss not greater than [\_\_\_\_\_] percent weighted averaged at five cycles when tested for soundness in magnesium sulfate in accordance with \-ASTM C 88-\ . The aggregate shall have a percentage of loss on abrasion not to exceed [\_\_\_\_\_] after 500 revolutions as determined by \-ASTM C 131-\ . The percentage of flat and/or elongated particles as determined by \-CRD-C 119-\ shall not exceed 20 in the fraction retained on the ½-inch sieve, in the fraction passing the ½-inch sieve but retained on the #4 sieve and in the percent passing the #4 sieve but retained on the #16 sieve. A flat particle is one having a ratio of width to thickness greater than 3: an elongated particle is one having a ratio of length to width greater than 3. When the aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set forth herein. When the aggregate is supplied from crushed gravel it shall be manufactured from gravel particles 90 percent of which by weight are retained on the maximum-size sieve listed in TABLE I. In the portion retained on each sieve specified, the crushed gravel shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the face. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces.

#### 2.1.2 Gradation Requirements

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NOTE: The gradation or gradations applicable to the specific job will be specified. The designer shall select gradation A or B depending on the required permeability. Both gradations should not be in the contract documents. Gradation A should provide a permeability greater than 1000 feet per day. Gradation B should provide a permeability of greater than 5000 feet per day. Gradation A is well graded enough to be stable to work on, however gradation B will require the choke stone to lock the surface together to provide a stable working platform. If experience with aggregates in the project area indicates that they break down during compaction, then the designer should consider using the cement or asphalt stabilized drainage layer.



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When editing the specification, take the A or B designation off the gradation, unless both gradations are used. The maximum size of aggregates will be specified in the blank space. The gradation for the open graded choke stone matches ASTM gradation No. 8.

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Gradation requirements specified herein shall apply to the completed drainage layer course. The aggregates shall have a maximum size of [\_\_\_\_\_] inch(e's) and be well graded within the limits specified in TABLE I.

TABLE I. GRADATION OF DRAINAGE LAYER MATERIAL  
(See Notes 1-3)

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	Drainage Layer Gradation[A]	Drainage Layer Gradation[B]	Open Graded Choke Stone
1-1/2 inch	100	100	100
1 inch	70-100	95-100	100
3/4 inch	55-100	---	100
1/2 inch	40-80	25-80	100
3/8 inch	30-65	---	80-100
No. 4	10-50	0-10	10-100
No. 8	0-25	0-2	0-40
No. 16	0-5	---	0-10

NOTE 1: Particles having diameters less than 0.02 mm shall not be in excess of 1.5 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves may require appropriate correction by the Contracting Officer when aggregates of varying specific gravities are used.

\*\*\*\*\*

Select the first Note 3 if gradation A is used and select the second Note 3 if gradation B is used.

\*\*\*\*\*

[NOTE 3: For the specified gradation the coefficient of uniformity (CU) shall be greater than 3.5 ( $CU = D_{60}/D_{10}$ ).]

[NOTE 3: Choke stone will be required to stabilize the top surface of the drainage layer material. The choke stone shall

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be a small size stone made up of hard, durable crushed aggregate having 90 percent of the stone with fractured faces. The gradation for the choke stone shall be based on the gradation of the material submitted for use as drainage layer material, using the following criteria:

1. The ratio of the  $D_{15}$  of the drainage layer material to the  $D_{15}$  of the choke stone must be less than 5.
2. The ratio of the  $D_{50}$  of the drainage layer material to the  $D_{50}$  of the choke stone must be greater than 2.]

### PART 3 EXECUTION

#### 3.1 OPERATION OF AGGREGATE SOURCES

Clearing, stripping, and excavating shall be the responsibility of the Contractor. The aggregate sources shall be operated in such a manner as to produce the quantity and quality of drainage layer materials meeting these specification requirements in the specified time limits. Upon completion of the work, the aggregate sources on private lands shall be conditioned in agreement with local laws or authorities.

#### 3.2 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, shall be stockpiled in a manner so as to prevent segregation and at the locations designated by the Contracting Officer. Materials obtained from different sources shall be stockpiled separately.

#### 3.3 TEST SECTION

##### 3.3.1 General

The test section shall be used to evaluate the trafficability and constructibility of the drainage layer material as well as to determine the required mixing, placement, and compaction procedures. Test section data shall be used to determine the required number of passes, the optimum moisture content, the target dry density and the need for a final static pass of the roller (without vibration) to smooth the drainage layer surface.

##### 3.3.2 Scheduling

The test section shall be constructed a minimum of [30) days

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prior to the start of paving operations to provide sufficient time for an evaluation of the proposed materials, equipment and procedures including Government QA testing.

#### 3.3.3 Location and Size

The test strip shall be placed outside the production paving areas in an area with similar subgrade conditions approved by the Contracting Officer. The underlying courses and subgrade preparation, required for the pavement section, shall be completed, inspected and approved in the test section prior to placing the drainage layer. The test section shall be a minimum of (100) feet long and one full paving lane wide.

#### 3.3.4 Initial Testing

Certified test results, to verify the materials proposed for use in the test section meet the contract requirements in paragraph "AGGREGATES", shall be provided by the contractor at his expense, and approved by the Contracting Officer prior to the start of the test strip.

#### 3.3.5 Mixing and Placement

Mixing of aggregate blends shall be performed by a central pugmill type mixer and delivered to the site. Placement shall be accomplished by using an asphalt paving machine meeting the requirements in paragraph "EQUIPMENT".

#### 3.3.6 Compaction

Compaction shall be accomplished by using a vibratory roller meeting the requirements of paragraph "EQUIPMENT" and operating at a maximum rolling speed of 1.5 miles per hour.

#### 3.3.7 Procedure

The test section shall be divided into three subsections of different aggregate water contents to help establish a correlation between aggregate water content, the number of roller passes, and the target dry density to be achieved in the field. Density and moisture content tests shall be conducted at the surface and at intervals of 2 inches of depth down for the total layer thickness, using calibrated nuclear density gauges. A sieve analysis test shall be conducted on a composite sample, taken adjacent to the density test locations, which represents the total layer thickness. One set of tests shall be taken before compaction and after each subsequent compaction pass in each subsection. Compaction passes and density readings shall continue until the difference between the average dry densities of any two consecutive passes is less than or equal to 0.5 pcf.

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The test section shall be completed by making one final pass with the roller in the static mode and observing the change in the drainage layer surface texture.

#### \+3.3.8 Evaluation+\

Within 10 days of completion of the test:section, the contractor shall submit to the contracting officer the Test Section Construction Report complete with all of the data from the required testing. The contracting officer shall evaluate the data and provide to the contractor the required number of passes of the roller, the target dry density and moisture content for field density testing during construction, the depth at which to check the moisture and density, and the need for a static pass of the roller.

\*\*\*\*\*  
The evaluation of the data from the test section shall be accomplished by the district designer. The evaluation should be based on trying to achieve maximum density in the drainage layer without excessive crushing of the aggregates during compaction. The harder and more durable the aggregate the more compaction effort it can withstand. To evaluate the test fill data it is suggested that the in-place density and percent passing the No. 4 and No. 16 sieve sizes should be plotted against cumulative passes. With these results the designer should try to optimize dry density while minimizing aggregate degradation. Generally after between 3 and 6 passes, only slight increases in dry density will be achieved (0.5 pcf). At this point the measured field density is at or near the maximum density obtainable for this material, for the given field conditions. The target dry density should then be set slightly lower than this maximum field dry density. At is suggested that the target dry density be set at 98 percent of the maximum density obtained in the test section. The data on the percent passing should be looked at closely to determine if degradation of the aggregate is occurring. If the percent passing the given sieve sizes is increasing, then the aggregate is being broken down by the compaction effort. If this is occurring, selection of a target field density will be more difficult. The target field density selected will have to be balanced between aggregate degradation, dry density and stability of the drainage layer surface. Stability of the layer surface should take precedence.  
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#### 3.4 PREPARATION OF UNDERLYING COURSE

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NOTE: Only the reference to the specification section that covers the preparation of underlying course for the particular project will be retained; other references will be deleted. The surface of a cohesionless underlying courses may require stabilization prior to placement of the drainage layer course. This may be accomplished by compacting a layer of crushed aggregate into the surface. It may also be obtained by methods based on local experience. These methods (e.g., use of cement, lime, bitumen, and chemicals), as well as any stabilization of cohesive materials, will be subject to approval by HQUSACE (CEMP-ET). The additional crushed aggregate will be considered as part of the underlying course and may be paid for or included in the specification section that covers the preparation of that particular course for the particular project.

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Prior to constructing the drainage layer, the underlying course shall be cleaned of all foreign substances. During construction the underlying course shall contain no frozen material. The underlying course shall conform to [Section \=02230=\ EXCAVATION, EMBANKMENT, AND PREPARATION OF SUBGRADE FOR RAILROADS AND ROADWAYS] [Section \-02234-\ SUBBASE COURSE] [Section \-02232-\ SELECT-MATERIAL SUBBASE COURSE]. Ruts or soft, yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the drainage layer is placed.

### 3.5 GRADE CONTROL

During construction, the lines and grades including crown and cross slope indicated for the drainage layer course shall be maintained by means of line and grade stakes placed by the Contractor.

### 3.6 MIXING AND PLACING

The drainage layer material shall be placed on the underlying course in lifts of uniform thickness with an asphalt paving machine or an approved hopper type base course spreader box. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single lift. When a compacted layer in excess of 6 inches is required, the material shall be placed in lifts of equal thickness. No lift shall exceed 6 inches or be less than 3 inches when

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compacted. The lifts shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the drainage layer is placed in more than one lift, the previously constructed lift shall be cleaned of loose and foreign matter. Such adjustments in placing procedures or equipment shall be made to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable drainage layer.

### 3.7 COMPACTION

#### 3.7.1 Requirements

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NOTE: Cohesionless materials are generally free-draining, and the highest practicable water content is limited by the amount of water the material will retain, as is usually evidenced by free water draining from the mold during compaction. The words in brackets will be included only if the drainage layer material is used for shoulders.  
\*\*\*\*\*

Compaction shall be accomplished by using a 10 to 15 ton dual or single smooth drum vibratory roller operating at a maximum rolling speed of 1.5 miles per hour. Each lift of drainage material [including shoulders] shall be compacted with the number of passes of the roller as determined by the test section. A field dry density of at least 100 percent of target field dry density determined from the test section is required. If the required field dry density is not obtained, the number of roller passes shall be adjusted in accordance with paragraph DEFICIENCIES. Water content shall be maintained during the compaction procedure such that the water Content will be within plus or minus 2 percent of the optimum water content determined by the test section. In all places not accessible to the rollers, the drainage layer material shall be compacted with mechanical hand operated tampers.

### 3.8 Finishing

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Select the appropriate paragraph or paragraphs below. The first paragraph is to be used if Gradation A is used. The first and second paragraphs are to be used if Gradation B is used.  
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3.8.1 Finishing Drainage Layer Material. The top surface of the drainage layer shall be finished after final compaction as determined from the test section. Adjustments in rolling and finishing procedures shall be made to obtain grades, to

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minimize segregation and degradation of the drainage layer material, to adjust the water content, and to insure an acceptable drainage layer.

[3.8.2 Choke Stone Placement. After final compaction, the surface of the drainage layer material shall be stabilized by a thin layer of choke stone. The layer thickness shall not be greater than  $\frac{1}{2}$  inch and shall be spread using a paver or spreader box. The choke stone shall be worked into the surface of the drainage layer material by the use of a vibratory roller and by wetting. The choke stone shall be considered as part of drainage layer thickness, and shall not be measured separately.]

### 3.9 PROOF ROLLING

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NOTE: Drainage layer material will not require proof rolling. For airfield pavements, proof rolling will be required on base or subbase course layers above and below the drainage layer. That proof rolling should be covered in the appropriate specification section.  
\*\*\*\*\*

Proof rolling of the drainage layer shall not be required.

### 3.10 EDGES OF DRAINAGE LAYER

Material shall be placed along the edges of the drainage layer in such quantity as will compact to the thickness of the layer being constructed. When the drainage material layer is being constructed in two or more lifts, at least a 1-foot width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each lift of the drainage material course.

### 3.11 \+SMOOTHNESS TEST+\

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NOTE: A 12-foot straightedge with the deviations unchanged may be specified instead of a 10-foot straightedge.  
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The surface of the top layer shall not deviate more than  $\frac{3}{8}$  inch when tested with a 10-foot straightedge applied parallel

with and at right angles to the centerline of the area to be paved. Deviations exceeding  $\frac{3}{8}$  inch shall be corrected in accordance with paragraph DEFICIENCIES.

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### 3.12 THICKNESS CONTROL

The completed thickness of the drainage layer course shall be within 1/2 inch of the thickness indicated. The thickness of the drainage layer course shall be measured at intervals providing at least one measurement for each 500 square yards of drainage layer. The depth measurement shall be made by test holes at least 3 inches in diameter. Where the measured thickness of the drainage layer is more than 1/2 inch deficient, such areas shall be corrected in accordance with paragraph DEFICIENCIES. Where the measured thickness of the drainage layer is 1/2 inch more than indicated, it will be considered as conforming with the requirements plus 1/2 inch, provided the surface of the drainage layer is within 1/2 inch of established grade. The average job thickness shall be the average of all job measurements as specified above but within 1/4 inch of the thickness shown on the drawings.

### 3.13 DEFICIENCIES

#### 3.13.1 Grade, and Thickness

Deficiencies in grade and thickness shall be corrected such that both grade and thickness tolerances are met. In no case will thin layers of material be added to the top surface of the drainage layer to meet grade or increase thickness. If the elevation of the top of the drainage layer is more than 1/2 inch above the plan grade it shall be trimmed to grade and finished in accordance with paragraph FINISHING. If the elevation of the top surface of the drainage layer is 1/2 inch or more below the required grade, the surface of the drainage layer shall be scarified to a depth of at least 3 inches, new material shall be added, and the layer shall be blended and recompacted to bring it to grade. Where the measured thickness of the drainage layer is more than 1/2 deficient, such areas shall be corrected by excavating to the required depth and replacing with new material with a minimum compacted lift thickness of at least 3 inches. The depth of required excavation shall be controlled to keep the final surface elevation within grade requirements and to preserve layer thicknesses of materials below the drainage layer.

#### 3.13.2 Density

Density shall be considered deficient if the field dry density test results are below 100 percent of the target dry density.



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If the densities are deficient, then the layer shall be rolled with 2 additional passes of the specified roller. If the dry density is still deficient, then work will be stopped until the cause of the low dry densities can be determined by the Contracting Officer.

### 3.13.3 Smoothness

Deficiencies in smoothness shall be corrected as if they are deficiencies in grade or thickness. All tolerances for grade and thickness must be maintained while correcting smoothness deficiencies.

### 3.14 MAINTENANCE

The drainage layer shall be maintained in a condition that will meet all specification requirements until accepted.

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### ADDITIONAL NOTES

NOTE A: For additional information on the use of all CEGS, see CEGS-0100\00 CEGS GENERAL NOTES.

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-- End of Section --